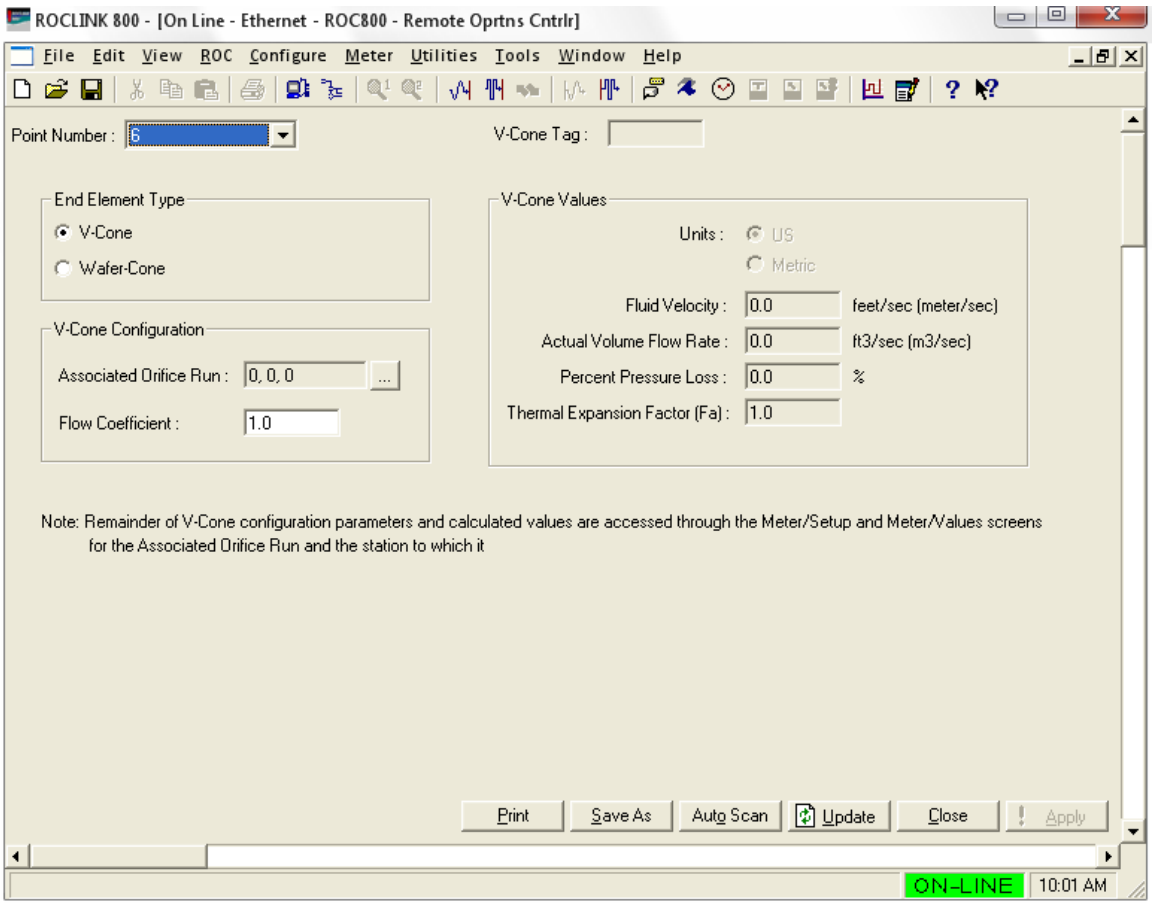
Form A6149
Part Number D301193X012
October 2013

V-Cone® Metering Program (for the ROC800-Series) User Manual


ROCLINK 800 - [On Line - Ethernet - ROC800 - Remote Oprtns Cntrlr]
File Edit View ROC Configure Meter Utilities Tools Window Help
Point Number : 6
V-Cone Tag :
End Element Type
V-Cone
Wafer-Cone
V-Cone Values
Units : US
Metric
Fluid Velocity : 0.0 feet/sec (meter/sec)
Actual Volume Flow Rate : 0.0 ft3/sec (m3/sec)
Percent Pressure Loss : 0.0 %
Thermal Expansion Factor (Fa) : 1.0
V-Cone Configuration
Associated Orifice Run : 0, 0, 0
Flow Coefficient : 1.0
Note: Remainder of V-Cone configuration parameters and calculated values are accessed through the Meter/Setup and Meter/Values screens for the Associated Orifice Run and the station to which it
Print
Save As
Auto Scan
Update
Close
Apply
ON-LINE
10:01 AM

Remote Automation Solutions

EMERSON.
Process Management

Revision Tracking Sheet

October 2013

This manual may be revised periodically to incorporate new or updated information. The revision date of each page appears at the bottom of the page opposite the page number. A change in revision date to any page also changes the date of the manual that appears on the front cover. Listed below is the revision date of each page (if applicable):

Page	Revision
All	Oct-13
All	May-12
All	Oct-11
ii, 1, 5, 6	Apr-04
Initial Issue	Sep-03

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Chapter 1 – Introduction

This chapter describes the structure of this manual and presents an overview of the V-Cone® Metering program for the ROC800-Series Remote Operations Controller (ROC800).

1.1 Scope and Organization

This document serves as the user manual for the V-Cone Metering user program, which is intended for use in ROC800. This manual describes how to download and configure the V-Cone Metering user program (referred to as the "V-Cone program" or "the program" throughout the rest of this manual). You access and configure the program using ROCLINK™ 800 Configuration Software (version 2.00 or greater) loaded on a personal computer (PC) running Microsoft® Windows® 2000 (with Service Pack 2), Microsoft Windows XP, Microsoft Windows Vista™, or Microsoft Windows 7.

The sections in this manual provide information in a sequence appropriate for first-time users. Once you become familiar with the procedures and the software running in a ROC800, the manual becomes a reference tool.

This manual has the following major sections:

- *Section 1 – Introduction*
- *Section 2 – Installation*
- *Section 3 – Configuration*
- *Section 4 – Reference*

This manual assumes that you are familiar with the ROC800 units and their configuration. For more information, refer to the following manuals:

- *ROC800-Series Remote Operations Controller Instruction Manual* (Form A6175).
- *ROCLINK 800 Configuration Software User Manual (for ROC800-Series)* (Form A6218).

1.2 Product Overview

The V-Cone program allows a ROC800 to calculate a corrected volumetric flow rate at a specified base pressure and temperature for a McCrometer V-Cone or Wafer-Cone flowmeter. The V-Cone or Wafer-Cone flowmeter is very similar to an orifice plate calculation, uses many of the same configuration parameters, and produces many of the same calculated values. For this reason, the user program makes use of existing orifice meter run points already provided by the ROC800 firmware. In addition to the standard orifice point parameters, the ROC800 also calculates an actual volumetric flow rate, a fluid velocity, a thermal expansion factor, and the percent pressure loss in accordance with the

McCrometer specification *McCrometer Flow Calculations for the V-Cone Flowmeter, October 2002*.

As part of the V-Cone program point configuration, you assign the V-Cone or the Wafer-Cone calculation to an orifice meter point. When the calculation is assigned, the standard AGA3 calculation is bypassed and the McCrometer calculation is performed instead. All standard orifice parameters, as well as the additional V-Cone program parameters, are available for assignment to Modbus registers, PID control loops, historical archiving, and FST and DS800 database functions.

1.3 Program Requirements

The V-Cone program version 1.11 is compatible with ROC800-Series 2 firmware version 3.30 (or greater), ROC800-Series 1 firmware version 2.16 (or greater), ROC800L firmware version 1.20 (or greater), and with version 2.00 (or greater) of ROCLINK 800 configuration software. The program requires you to install an AGA 3/7/8 hardware-based license key to enable the calculations, and a V-Cone license key to enable the user program.

Notes:

- Two versions of the program are included. Installation and operation are identical between the two programs, but they use different point type locations, different display numbers. V-Cone.61.tar uses point types 61 and uses display 61. V-Cone.71.tar uses point types 71 and uses display 71. Install the program version that avoids point type conflicts with currently installed programs.
- The installation process and functionality is the same for all versions of the V-Cone program.

Program specifics include:

File Name	Target Unit/ Version	User Defined Point (UDP)	Flash Used (in bytes)	SRAM Used (in bytes)	DRAM Used (in bytes)	ROCLINK 800 Version	Display Number
V-Cone.61.tar	ROC800-Series 2 v. 3.30	61	16151	408	73728	2.00	61
	ROC800-Series 1 v. 2.16						
V-Cone.71.tar	ROC800-Series 2 v. 3.30	71	16151	408	73728	2.00	71
	ROC800-Series 1 v. 2.16						

For information on viewing the memory allocation of user programs, refer to *Section 7.7* of the *ROCLINK 800 Configuration Software User Manual (for ROC800-Series)* (Form A6218).

1.3.1 License Keys

License keys, when matched with valid license codes, grant access to applications such as the V-Cone program. An AGA3/7/8 license key must be present to provide the required number of meter runs, and a separate license key is also required to enable the V-Cone user program.

The term “license key” refers to the physical piece of hardware that can contain up to seven different licenses (refer to *Figure 1–1*). Each ROC800 can have none, one, or two license keys installed. If you remove a license key after enabling an application, the firmware disables the task from running. This prevents unauthorized execution of protected applications in a ROC800.

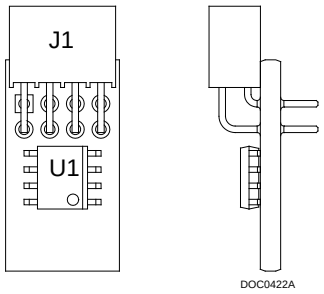

Figure 1-1. License Key

Chapter 2 – Installation

This section provides instructions for installing the V-Cone program into the ROC800. Read *Section 1.3* of this manual for program requirements.

Notes:

- The computer running ROCLINK 800 must be connected to the Local Operator Interface (LOI) port before you begin the download.
- The program and license key can be installed in any order. The manual shows the installation of the license key first.
- The installation process and functionality is the same for all versions of the V-Cone program.

2.1 Installing the License Key

If you order the V-Cone program for a new ROC800, your ROC800 is delivered with the license key installed. Go to *Section 2.2*. If you order the program for an existing ROC800, you must install the license key yourself.

⚠ Caution

Failure to exercise proper electrostatic discharge precautions, such as wearing a grounded wrist strap may reset the processor or damage electronic components, resulting in interrupted operations.

When working on units located in a hazardous area (where explosive gases may be present), make sure the area is in a non-hazardous state before performing these procedures. Performing these procedures in a hazardous area could result in personal injury or property damage.

To install a license key:

1. Remove power from the ROC800.
2. Remove the wire channel cover.
3. Unscrew the screws from the Central Processing Unit (CPU) faceplate.
4. Remove the CPU faceplate.
5. Place the license key in the appropriate terminal slot **(P4** or **P6)** in the CPU.

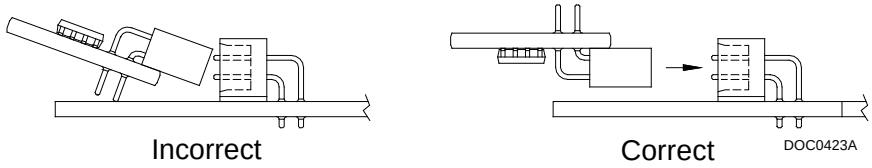

Figure 2-1. License Key Installation

Note: When using a single license key, install it in **slot P4**.

6. Press the license key into the terminal until it is firmly seated (refer to *Figure 2–1*).
7. Replace the CPU faceplate.
8. Replace the screws on the CPU faceplate.
9. Replace the wire channel cover.
10. Restore power to the ROC800.

2.1.1 Verifying the License Key Installation

After you install the license key, you can verify whether the ROC800 recognizes the key. From the ROCLINK 800 screen, select **Utilities** > **License Key Administrator**. The License Key Administrator screen displays:

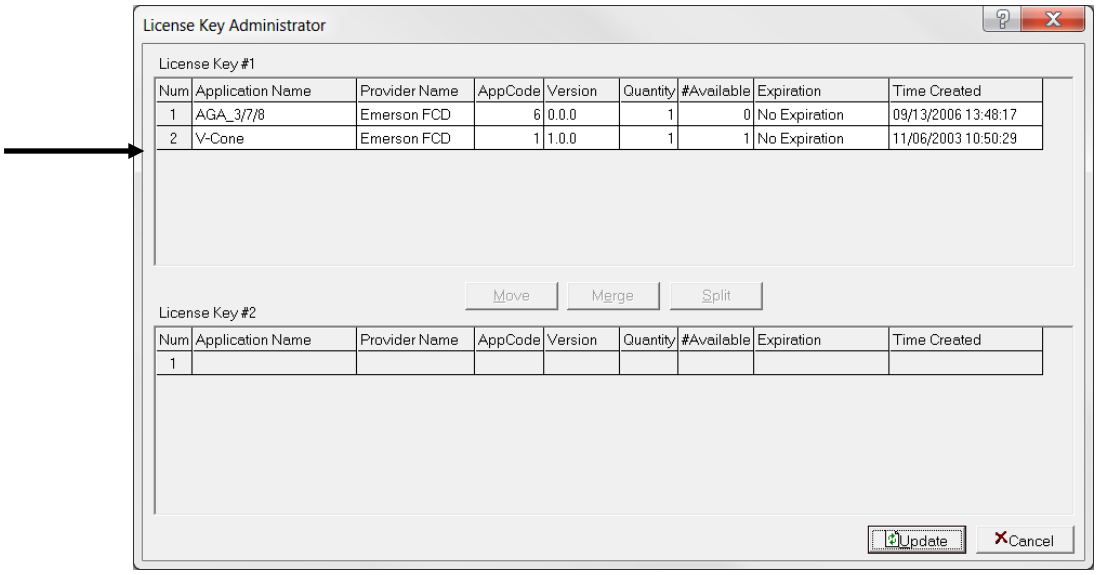
License Key Administrator
License Key #1
Num Application Name Provider Name AppCode Version Quantity #Available Expiration Time Created
1 AGA_3/7/8 Emerson FCD 6 0.0.0 1 0 No Expiration 09/13/2006 13:48:17
2 V-Cone Emerson FCD 1 1.0.0 1 1 No Expiration 11/06/2003 10:50:29
Move
Merge
Split
License Key #2
Num Application Name Provider Name AppCode Version Quantity #Available Expiration Time Created
1
Update
Cancel

Figure 2-2. License Key Administrator

V-Cone appears in the Application Name column. [For further information on the License Key Administrator screen, refer to *Section 2.4* of the *ROCLINK 800 Configuration Software User Manual (for ROC800-Series)* (Form A6218).]

After you verify that the license key is correctly installed and recognized, proceed to *Section 2.2* to download the user programs.

2.2 Downloading the V-Cone Program

This section provides instructions for installing the V-Cone program into the Flash memory on the ROC800.

Note: Connect a PC to the ROC's LOI port **before** starting the download.

To download the user program:

1. Select any empty program number (in this case, number 1) into which to download the program:

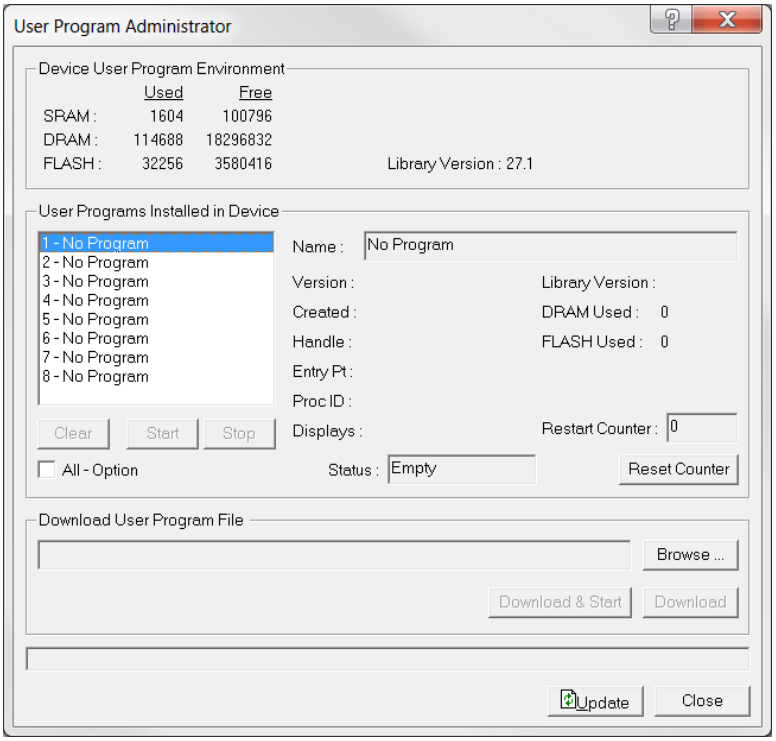

Figure 2-3. User Program Administrator

2. Click **Browse** in the Download User Program File frame. The Select User Program File screen displays (see *Figure 2–4*).
3. Select the path and user program file to download from the CD-ROM. (Program files are typically located in the Program Files folder on the CD-ROM.) As *Figure 2–4* shows, the screen lists all valid user program files with the .TAR extension:

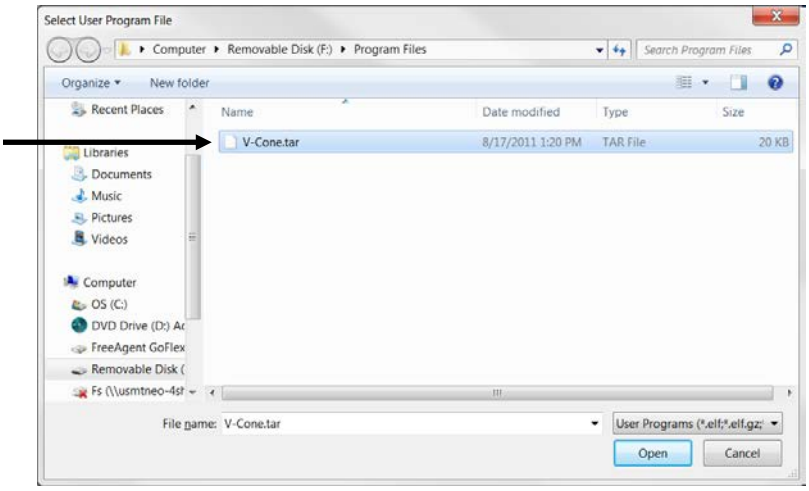

Figure 2-4. Select User Program File

11. Click **Open** to select the program file. The User Program Administrator screen displays. As shown in *Figure 2–5*, note that the Download User Program File frame identifies the selected program and that the **Download & Start** button is active:

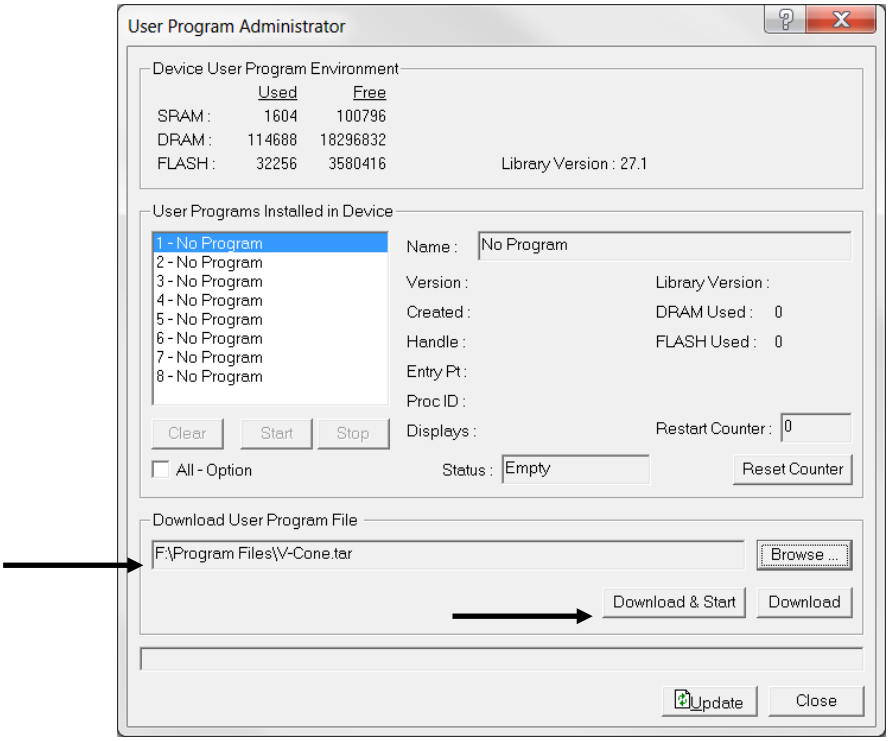

Figure 2-5. User Program Administrator

12. Click **Download & Start** to begin loading the selected program. The following message displays:

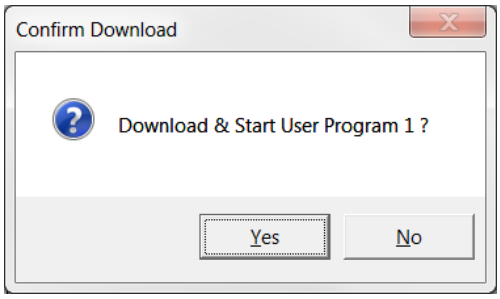

Figure 2-6. Confirm Download

13. Click **Yes** to begin the download. The following message displays when the download completes:

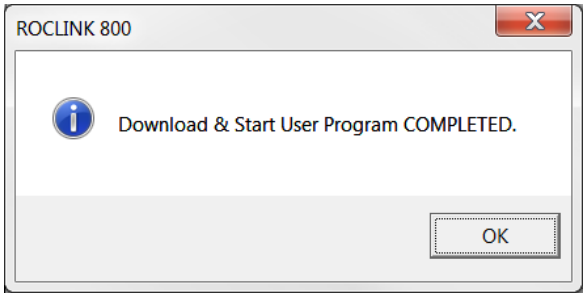

Figure 2-7. ROCLINK 800 Download Confirmation

14. Click **OK**. The User Program Administrator screen displays (see *Figure 2-8*). Note that:

- The Device User Program Environment frame reflects the use of system memory.
- The User Programs Installed in Device frame identifies the installed program(s).
- The Status field indicates the program is loaded and running.

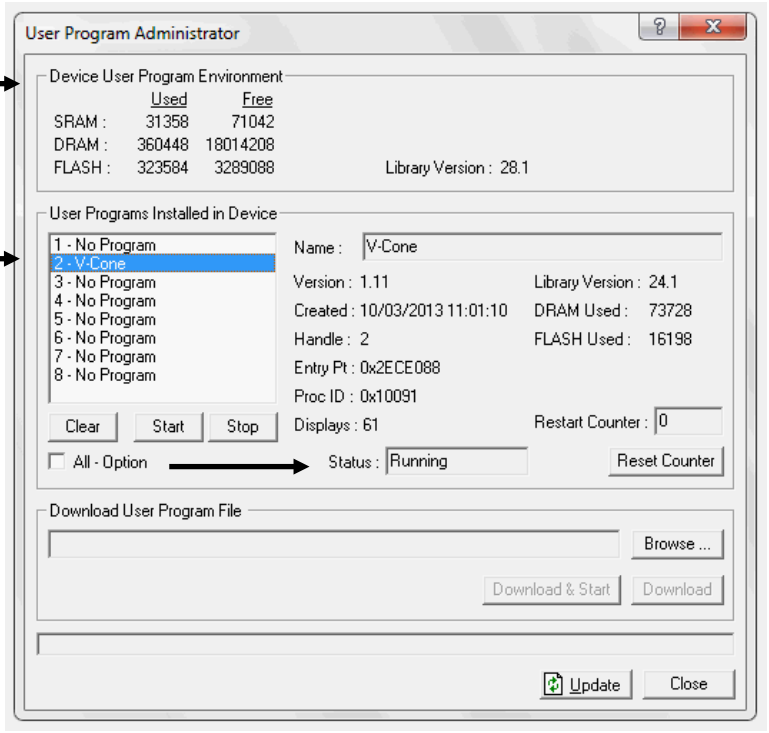

Figure 2-8. User Program Administrator

15. Proceed to *Section 3* to configure the programs.

Chapter 3 – Configuration

After you have loaded the V-Cone program, you configure it using ROCLINK 800 software. Most of the configuration for the V-Cone meter is done through the standard orifice meter setup screen and the station setup screen for the station to which the orifice meter belongs. For more information, refer to *ROCLINK 800 Configuration Software User Manual (for ROC800-Series)* (Form A6218).

To do this, you use one program-specific screen (V-Cone Configuration) and two standard ROCLINK 800 screens (Orifice Meter Setup and Station Setup):

- Use the V-Cone Configuration screen to enable, select the McCrometer type along with the corresponding flow coefficient, and assign the V-Cone calculation for a specific meter run.
- Use the Station Setup screen to configure parameters common to multiple meter runs.
- Use the Orifice Meter Setup screen to configure parameters for a single meter run for use with the V-Cone program.
- Use the Orifice Values screen to view values calculated by the V-Cone program.

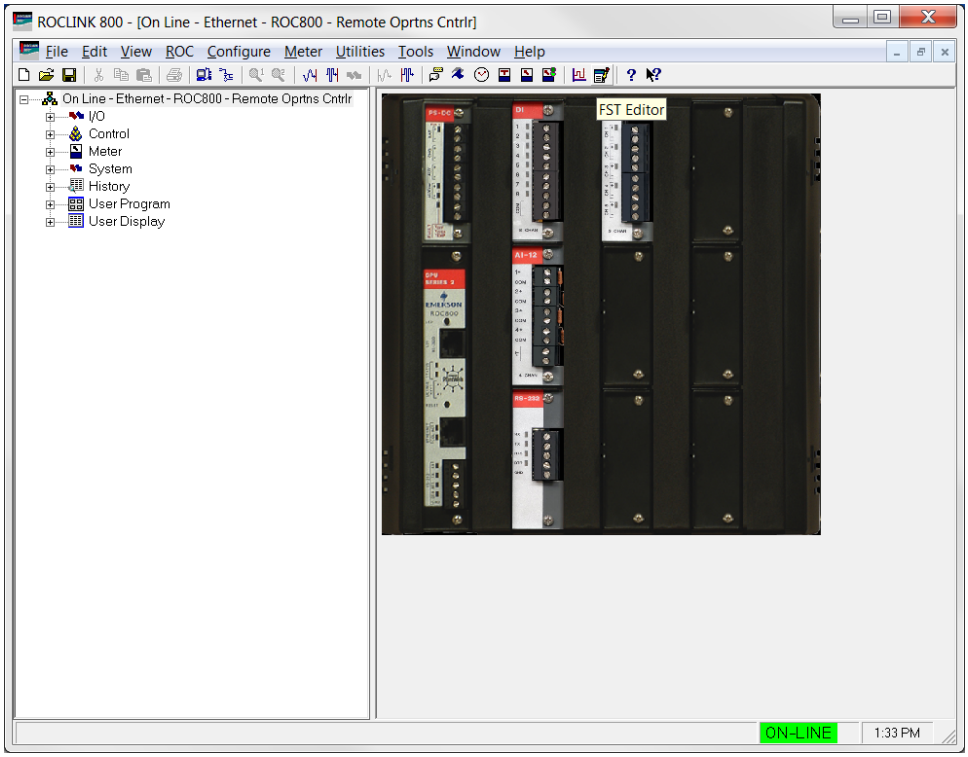

Figure 3-1. ROCLINK 800 screen

3.1 V-Cone Configuration Screen

Use the V-Cone configuration screen to assign the V-Cone meter to an existing orifice meter run and to enter the flow coefficient. You can also view the actual volumetric flow rate per second, the thermal expansion coefficient, the fluid velocity, and the percent pressure loss.

To access this screen:

1. From the Directory Tree, select **User Program** > **Program #1, V-Cone**.
2. Select **Display #61/71, V-Cone Configuration.**
3. Double-click **#1**. The V-Cone Configuration screen displays:

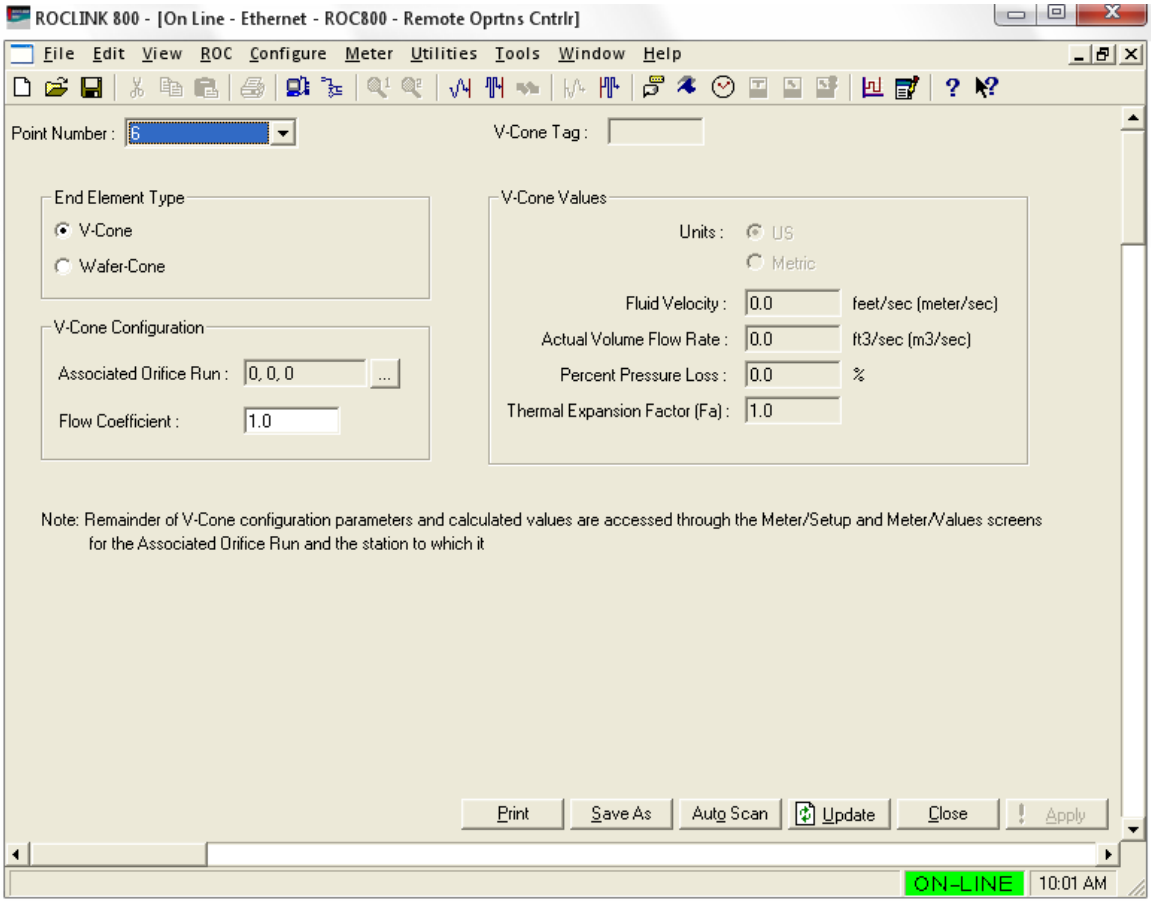
ROCLINK 800 - [On Line - Ethernet - ROC800 - Remote Oprtns Cntrlr]
File Edit View ROC Configure Meter Utilities Tools Window Help
Point Number : 6
V-Cone Tag :
End Element Type
V-Cone
Wafer-Cone
V-Cone Configuration
Associated Orifice Run : 0, 0, 0
Flow Coefficient : 1.0
V-Cone Values
Units : US
Metric
Fluid Velocity : 0.0 feet/sec (meter/sec)
Actual Volume Flow Rate : 0.0 ft3/sec (m3/sec)
Percent Pressure Loss : 0.0 %
Thermal Expansion Factor (Fa) : 1.0
Note: Remainder of V-Cone configuration parameters and calculated values are accessed through the Meter/Setup and Meter/Values screens for the Associated Orifice Run and the station to which it
Print
Save As
Auto Scan
Update
Close
Apply
ON-LINE
10:01 AM

Figure 3-2. V-Cone Configuration Screen

4. Review the values in the following fields:

Field	Description
Point Number	Indicates the iteration of the program you want to define. You can assign each iteration of the program (up to 12) to individual meter runs. Click ▼ to display additional iterations.

Field	Description
V-Cone Tag	This **read-only** field shows the meter tag for the selected meter. The meter tag is defined in **Meter>Setup**.
End Element Type	Specifies the end element type of the selected meter. Valid Selections are **V-Cone** and **Wafer-Cone**.
Associated Orifice Run	Sets the orifice meter used in V-Cone calculations for the selected point number. Either the Orifice Meter Run Configuration or Orifice Meter Run Values point type can be selected and any valid logical or parameter number. **Note:** The selected orifice meter point is automatically assigned a "User Defined Device" meter type and the user program will be in control of calculating all values except compressibility and density.
Flow Coefficient	Sets a user-defined value for calculations. This value is obtained from the V-Cone sizing and calibration report.
Units	This **read-only** field displays the units of measurement for this V-Cone point. Valid values are US or Metric. **Note:** The Units selection is made under **Meter>Setup>Station** for the station to which the associated orifice meter run belongs.
Fluid Velocity	This **read-only** field displays the velocity of the fluid through the V-Cone. Values are in feet/second or meters/second.
Actual Volume Flow Rate	This **read-only** field displays the volumetric flow rate at the flowing temperature and pressure. Values are in ft3/second or m3/second.
Percent Pressure Loss	This **read-only** field displays the permanent pressure loss at the V-Cone expressed as a percentage of the differential pressure.
Thermal Expansion Factor	This **read-only** field displays the correction for the expansion of the cone and pipe materials, due to differences between operating temperature and calibration temperature.

5. Click **Apply** to save any changes you have made to this screen.
6. Proceed to *Section 3.2* to configure the Orifice/Station configuration.

3.2 Station Setup

The Station Setup screen is accessed via **Meter** > **Setup** > **Station**. This screen allows for configuration of attributes that are common to multiple meter runs. General items such as the base pressure, base temperature, unit selection and gas quality data are configured here. On the general tab, several station values are displayed which represent the summation of all the meter runs in the station. For more information, refer to *ROCLINK 800 Configuration Software User Manual (for ROC800-Series) (Form A6218).*

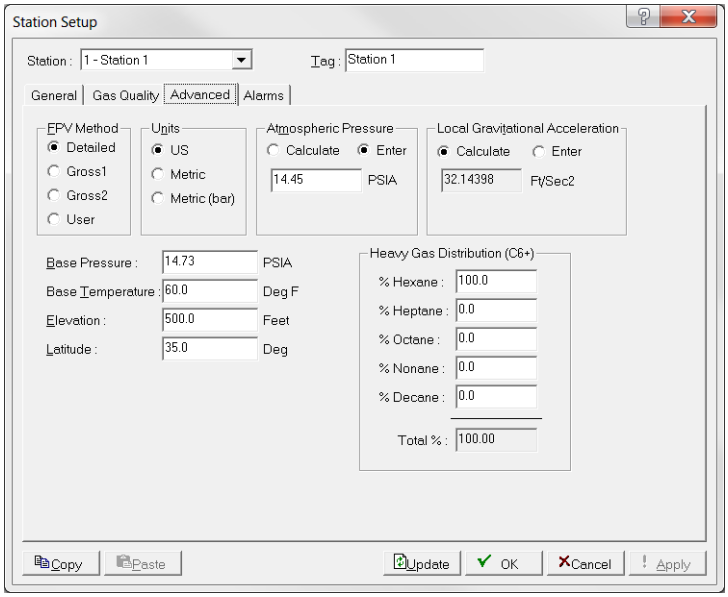

Figure 3-3. Station Setup – Advanced Tab

Review the configuration on this screen, and click **Apply** to save any changes you have made. Proceed to *Section 3.3* to configure the Meter Setup screen.

3.3 Orifice Meter Setup

The Orifice Meter Setup screen is accessed via **Meter** > **Setup** > **Orifice Meter**. This screen allows for configuration of attributes of a single orifice meter. The Meter Type selection on the Orifice Meter Setup screen is automatically set to "User Defined Device" by the V-Cone user program when the orifice meter point for the selected meter run is selected as the associated meter run in the V-Cone program. This has the effect of bypassing the standard AGA3 calculation and allows the V-Cone program to write the results of the V-Cone or Wafer-Cone calculation to the orifice meter point type.

The following parameters have different meanings for the V-Cone metering user program.

- **Orifice Diameter –** Represents the diameter of the V-Cone or Wafer-Cone Values are in inches or mm.

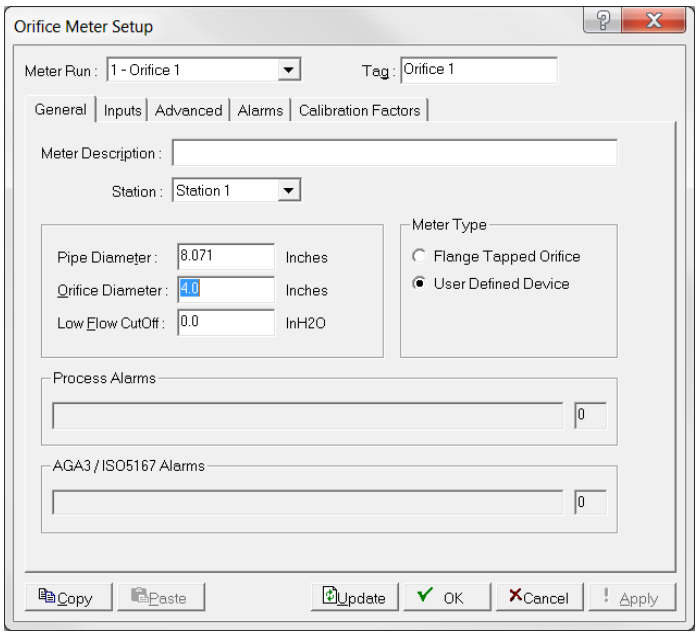

Figure 3-4. Orifice Meter Setup – General Tab

- **Orifice Material –** Represents the type of material of which the V-Cone or Wafer-Cone is constructed. Valid vales are Stainless Steel, Monel, or Carbon Steel.
- **Ref Temp –** Represents the temperature at which the V-Cone or Wafer-Cone diameter was measured. Values are in Deg F or Deg C.

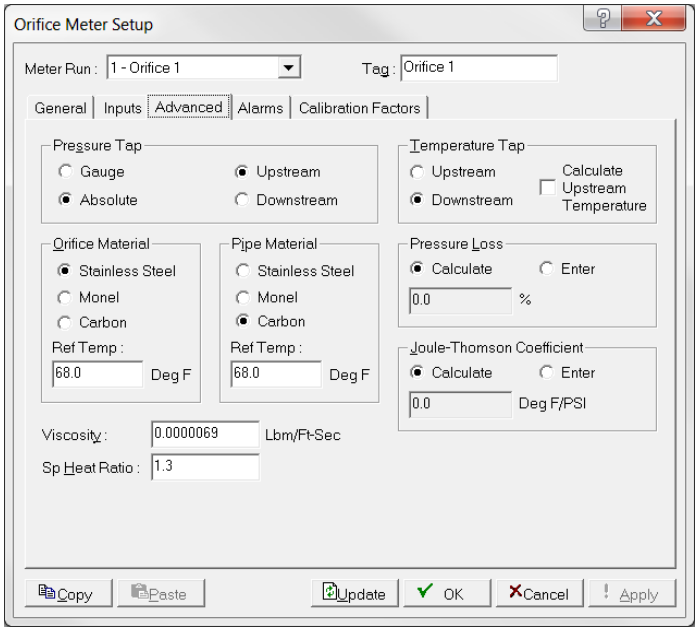

Figure 3-5. Orifice Meter Setup – Advanced Tab

Review the configuration on this screen, and click **Apply** to save any changes you have made. Proceed to *Section 3.3* to view orifice values.

3.4 Orifice Values

Parameters displayed on the **Meter > Values > Orifice Meter** screen represent values calculated by the V-Cone program for orifice meters associated with a V-Cone point number. The Orifice Diameter value on the Factors tab represents the V-Cone diameter in inches or mm. Values are calculated per the McCrometer V-Cone specification.

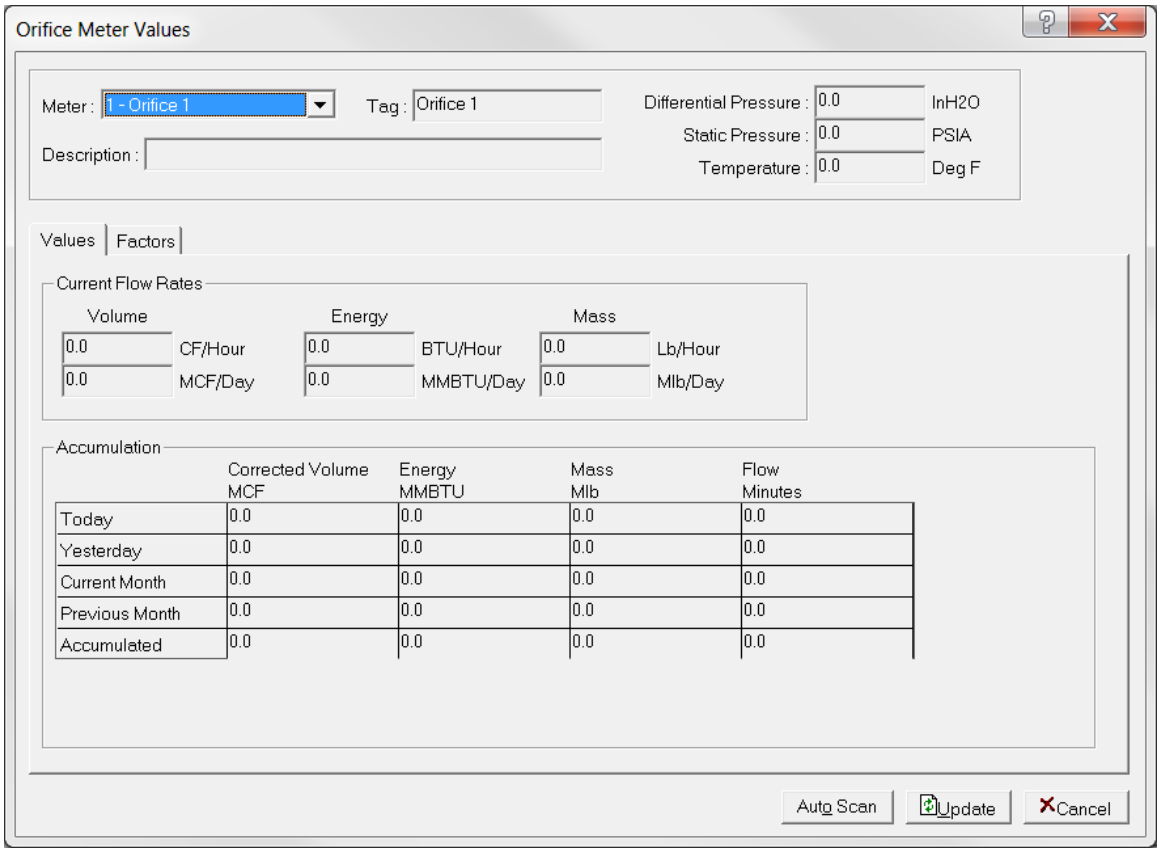

Figure 3-6 Orifice Meter Values

Proceed to *Section 3.5* to save your configuration.

3.5 Saving the Configuration

Whenever you modify or change the configuration, it is a good practice to save the final configuration to memory.

To save the configuration:

1. Select **ROC** > **Flags**. The Flags screen displays:

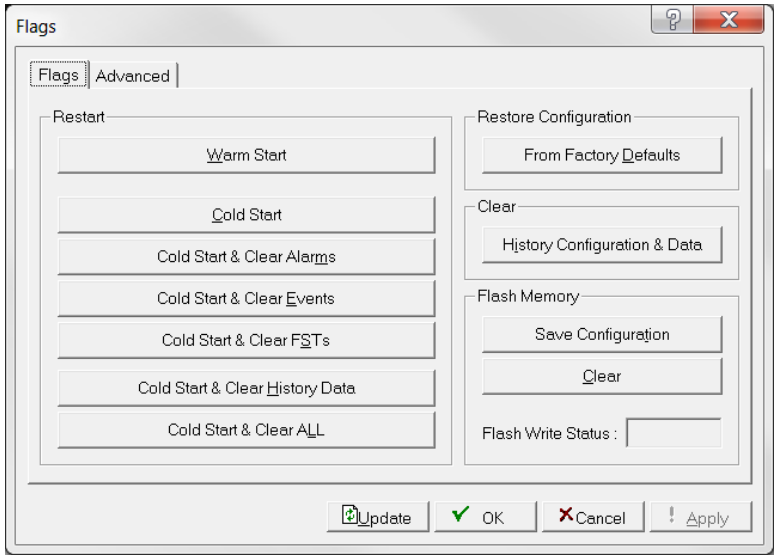

Figure 3-7 Flags screen

2. Click **Save Configuration**. A verification message displays:

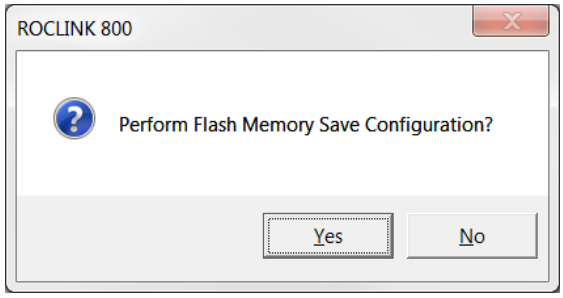

Figure 3-8 Perform screen

3. Click **Yes** to begin the save process. The Flash Write Status field on the Flags screen displays *In Progress*. When the process ends, the Flash Write Status field on the Flags screen displays *Completed* (see *Figure 3-9*).

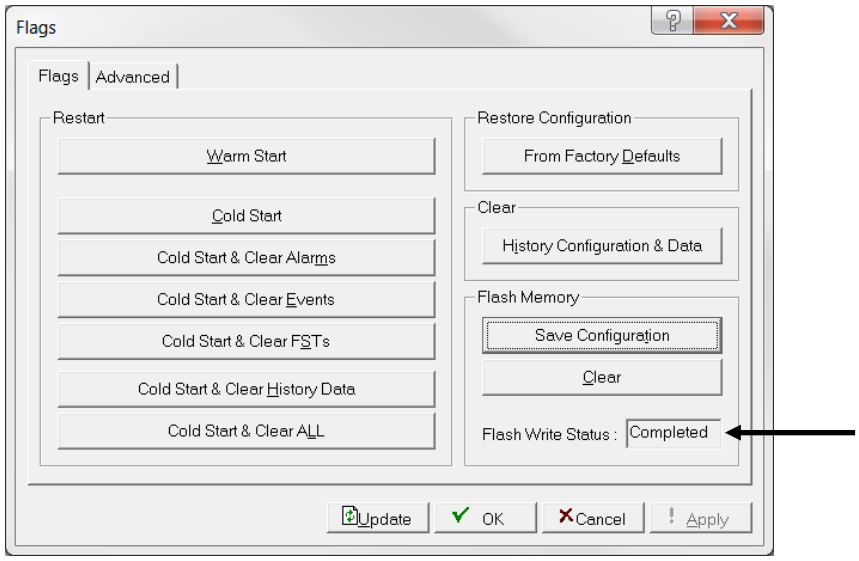

Figure 3-9 Flags screen

4. Click **Update** on the Flags screen. This completes the process of saving your new configuration.

Note: For archive purposes, you should also save this configuration to your PC's hard drive or a removable media (such as a diskette or a flash drive) using the **File** > **Save Configuration** option on the ROCLINK 800 menu bar.

Chapter 4 – Reference

This section provides tables of information on the user-defined point types used by the V-Cone program.

- Point Type 61/71 (V-Cone Metering Configuration)

4.1 Point Type 61/71: V-Cone Metering Configuration

Point type 61/71 contains the parameters for configuring the V-Cone program and contains the calculation results specific to V-Cone or Wafer-Cone. Up to 12 logical points of this point type will exist, equal to the number of AGA3/7/8 meter runs licensed.

Point Type 61/71: V-Cone Metering Configuration

Parm #	Name	Access	System or User Update	Data Type	Length	Range	Default	Version	Description of functionality and meaning of values
0	Point Tag Id.	R/O	Program	AC	10	0x20 → 0x7E for each ASCII character	" "	1.00	Identification name for the V-Cone meter run. The tag is assigned to the associated orifice meter run and the value is copied to the V-Cone point type 61. Values must be printable ASCII characters.
1	Associated Meter Run	R/W	User	TLP	3	113 or 114, 0→11, Any valid parameter	0, 0, 0	1.00	The associated orifice meter run contains most of the configuration parameters and calculated values for the V-Cone meter and provides the density and compressibility values to the V-Cone calculation.
2	Flow Coefficient	R/W	User	Float	4	>0.0 → 5.0	1.00	1.00	User entered flow coefficient, obtained from sizing and calibration reports.
3	Fluid Velocity	R/O	Program	Float	4	Any Positive Floating Point Number	0.00	1.00	Calculated value of fluid velocity in ft3/second or m3/second.
4	Thermal Expansion Factor	R/O	Program	Float	4	Any Positive Floating Point Number	1.00	1.00	Calculated value of thermal expansion factor. This factor corrects for the thermal expansion of the cone and pipe materials due to differences between operating temperature and calibration temperature.
5	Actual Volumetric Flow Per Second	R/O	Program	Float	4	Any Positive Floating Point Number	0.00	1.00	The volumetric flow rate at flowing pressure and temperature in ft3/sec or m3/sec.
6	Pressure Loss	R/O	Program	Float	4	0.0-100.0	0.00	1.00	The permanent pressure loss represented as a percentage of the differential pressure.

Point Type 61/71: V-Cone Metering Configuration

Parm #	Name	Access	System or User Update	Data Type	Length	Range	Default	Version	Description of functionality and meaning of values
7	Units	R/O	Program	UINT8	1	0 → 1	0	1.00	Indicates the engineering units for the process variables, inputs, and calculations. This selection is copied from the station to which the associated orifice meter belongs. 0 = English Units, 1 = Metric Units.
8	End Element Type	R/W	User	UINT8	1	0 → 1	0	1.10	End Element Type: 0 = V-Cone, 1 = Wafer-Cone

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